

DOCUMENT RESUME

ED 270 303

SE 046 599

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TITLE Initial Assessment of a Forgivable Loan Program for
Pre-service Mathematics and Science Teachers.
PUB DATE 4 Apr 86
NOTE 14p.; Paper presented at the Spring Joint Conference
on Teacher Education (Dallas, TX, April 4, 1986).
PUB TYPE Reports - Research/Technical (143) --
Tests/Evaluation Instruments (160)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Chemistry; *Mathematics Teachers; Middle Schools;
Physics; *Preservice Teacher Education; *Program
Descriptions; *Science Teachers; Secondary Education;
*Student Loan Programs; *Teacher Shortage
IDENTIFIERS *Texas

ABSTRACT

Described is the development and initial assessment of a forgiveable loan program designed to attract qualified students into a teacher education program to prepare for teaching mathematics in middle or high schools. The program was established in 1983 at Austin College by the King Foundation. Five qualified students a year may be awarded a King Scholar loan (\$2,000 per year), renewable if a 3.00 grade point average and satisfactory progress toward certification is maintained. For each year the recipient teaches mathematics, physics, or chemistry, a portion of the loan is forgiven. As of Spring 1986, 15 King Scholars had been selected; seven are still in the program, one is graduated and teaching, and seven exited the program. Thirteen of them responded to a questionnaire about the extent to which the loan program had influenced their educational career decisions, their views on the effectiveness of such programs, their current and/or former teaching fields, and (when appropriate) their reasons for leaving the program. Their replies are presented and discussed. It appears uncertain whether the program will be able to increase significantly the number of students being certified to teach in the targeted fields. (MNS)

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Initial Assessment of a Forgivable Loan Program
for Pre-service Mathematics and Science Teachers

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Presented at the Spring Joint Conference on
Teacher Education, Dallas, Texas, April 4, 1986

ED270303

SE 046 599

Initial Assessment of a Forgivable Loan Program for Pre-service Mathematics and Science Teachers

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OBJECTIVE

The objective of this paper is to describe the development and initial assessment of a forgivable loan program designed to attract qualified students into a teacher education program to prepare for the teaching of mathematics or science in high school or middle school. This study is limited to students at Austin College, one of four institutions participating in the forgivable loan program established by the Carl B. and Florence E. King Foundation. Results of a questionnaire distributed to King Scholars will be presented and discussed, tentative conclusions about the effectiveness of the program will be drawn, and suggestions will be offered.

PERSPECTIVES

The last few years have brought a growing shortage of qualified mathematics and science teachers for secondary schools in the United States (Blosser, 1984; Lashier and Ryoo, 1984; Odell and Fifer, 1985; Olstad and Beal, 1984; Sobel, 1983). Recent reports indicate that this shortage — particularly of mathematics teachers — will continue in Texas for at least the next five years (Texas Education Agency, 1986). Various plans have been proposed to attract and hold qualified science and mathematics teachers (Clark et al., 1984; Engel and Nall, 1984; Rush, 1983; Spector, 1984). Twenty-eight states have adopted forgivable loan programs to attract students to teacher education, with many of them emphasizing mathematics and science teaching.

The loans may be forgiven if the student teaches for a specified period of time after graduation. The success of these forgivable loan incentive programs appears to be uncertain at this time (Rodman, 1985).

Early in 1983, the Carl B. and Florence E. King Foundation of Dallas initiated contact with four teacher education programs in Texas, three at private institutions, one at a state-supported university, with the idea of developing a plan to attract highly qualified high school seniors or eligible college students into pre-service programs in secondary level mathematics and science teaching, and to encourage them to stay in teaching for several years after graduation. After a series of meetings, the King Scholar Loan Program in Mathematics and Science Teaching was established. It was implemented in August 1983. At each institution, five qualified students per year may be awarded a King Scholar Loan, which is renewable every semester presuming the student maintains a 3.00 grade point average and otherwise makes satisfactory progress toward secondary teacher certification in mathematics, physics, or chemistry. It was decided not to include biology as a teaching field because the teacher shortage appears to be less acute in that discipline. In a recent report of the Southern Regional Educational Board, Eva Galambos (1985) observes, "Obviously, too many science teachers specialize in biology and too few concentrate in the physical sciences." The amount of the loan is \$2000.00 per annum with all funding coming from the King Foundation. For each year the recipient teaches in his or her field in a public school or accredited private school in the United States after graduating, a portion of the loan is forgiven. Depending on the number of years the student has received the loan, the loan may be forgiven entirely in one to five years. (Austin College is the only participating institution offering a five year teacher education

program at this time.) It is the responsibility of each institution to screen candidates, monitor their progress, provide special support activities, and track recipients after graduation. Each King Scholar is responsible for sending the King Foundation a copy of his or her grades at the end of each semester along with a report of activities and a self-assessment. During the 1984-85 and 1985-86 academic years, additional foundation funds were made available to take King Scholars to professional conferences.

As of Spring 1986, Austin College has selected a total of 15 King Scholars. Seven are still in the forgivable loan program, one graduated and is now teaching, and seven exited the forgivable loan program for various reasons. The following sections will present and discuss the results of a questionnaire sent to all current and former Austin College King Scholars.

PROCEDURES

A questionnaire was sent to the 15 current and former Austin College King Scholars. The questionnaire elicited information about the extent to which the forgivable loan program had influenced their educational and career decisions, the respondent's view of the effectiveness of such programs, the respondent's current and/or former teaching field(s), and for those who exited the program, their reasons for leaving. Respondents were also invited to make suggestions about the King Scholar forgivable loan program. Thirteen of the subjects completed and returned the questionnaire, an 86.7% return rate. The results were tallied and will be discussed below.

FINDINGS

Six current King Scholars and 7 former ones returned completed

questionnaires. Of the 7 respondents no longer in the program, one graduated and is now teaching chemistry in a Texas high school, one became ineligible because of grades, and 5 left the forgivable loan program voluntarily. Of those exiting by their own choice, 2 changed from secondary mathematics to elementary teaching with biology specializations, and one left the teacher education program altogether. The last, a student who had already earned a B.A. and was returning for teacher certification, withdrew after one week of his first semester to continue full-time employment in the private sector.

Mathematics is the teaching field most often chosen by the King Scholars. Following are the teaching fields originally elected by the 13 respondents. Many of them have two teaching fields. It should be remembered that a student is eligible for the forgivable loan as long as at least one of his or her teaching fields is mathematics, chemistry, or physics.

Mathematics	12
Biology	3
P.E.	2
Chemistry	1
English	1
History	1
Psychology	1

The question, "How did you learn about the King Scholars forgivable loan program?" drew varied responses that may be categorized as follows.

Admissions/Financial Aid Office	6
Austin College education professor	3
Austin College mathematics professor	2
High school counselor	1
Other King Scholars	1

Three questions sought information on the influence of the forgivable loan program on the students' educational and career choices.

Was your decision to enter Austin College influenced by the King Scholars program

	current	exited	grad
a. not at all	4	4	0
b. to a slight extent	0	0	1*
c. to a moderate extent	0	1	0
d. to a great extent	2	1	0

*reentered after earning B.A. earlier

Was your decision to pursue a teaching career influenced by the King Scholars program

	current	exited	grad
a. not at all	5	2	1
b. to a slight extent	1	0	0
c. to a moderate extent	0	4	0
d. to a great extent	0	0	0

Was your decision to pursue at least one teaching field in math, chemistry, or physics influenced by the King Scholars program

	current	exited	grad
a. not at all	4	3	1
b. to a slight extent	2	0	0
c. to a moderate extent	0	3	0
d. to a great extent	0	0	0

When asked to assess the effectiveness of forgivable loan programs in general, subjects' responses fell into a pattern rather different from the three above. In your opinion, is a forgivable loan program such as the King Scholars program

	current	exited	grad
a. ineffective	0	0	0
b. slightly effective	0	1	0
c. moderately effective	0	1	1
d. greatly effective	6	4	0

in attracting qualified students and holding them in the teaching profession?

Four subjects responded when invited to suggest any changes in the King Scholars program. The graduate expressed a desire to see greater communication between King Scholars, current ones and graduates. The student who was dropped from the forgivable loan program for grades, but who continues to pursue mathematics and English certification, said, "Financially, it is not enough." A student who changed from secondary math to elementary with a biology specialization wished to have had "more concrete information about the program" before entering it. Two current King Scholars made comments. One would like to see less emphasis on the student's written report to the foundation each semester. The other had no suggestions, but merely expressed satisfaction and said, "I would encourage others to participate."

DISCUSSION

Obviously, the King Scholars forgivable loan program at Austin College has proved more successful in attracting pre-service mathematics teachers than ones in chemistry or physics. This is not necessarily a problem since the Texas Education Agency has predicted a shortage of 1215 mathematics teachers but only 370 science teachers by 1991. An important question, of course, is whether the college can now expect to graduate more teachers in these critical need areas than it did before the inception of the forgivable loan program.

At first glance, the loss rate seems high (7 out of 15). However, 4 of the seven who exited the forgivable loan program remained in the teacher education program, two left teacher education but remained at the college, and only one withdrew from the college. For all students in the teacher education program over the past several years, the attrition rate from the first teacher education course to completion has held steady at about 50%. So far, then, King Scholars are staying in teacher education at a higher rate than teacher education students in general. It is still too early to tell, though, whether the forgivable loan program will significantly increase the number of students being certified in mathematics, chemistry, or physics at the secondary level. The following tables show the number of students certified in those areas over the last seven years and projections for the next four years.

	Chemistry	Math	Physics
1985	0	0	0
1984	2*	0	0
1983	0	1	0
1982	0	2	0
1981	0	0	0
1980	0	4	0
1979	0	3	0

*includes one King Scholar

The following projections are based on current enrollment and may be subject to change. Unless otherwise indicated, the numbers represent current King Scholars.

	Chemistry	Mathematics	Physics
1990	0	2	0
1989	0	4x	0
1988	0	2	0
1987	1*	1*	0
1986	0	1x	0

* not a King Scholar

x includes 1 former King Scholar

It appears there will be an increase of mathematics teachers certified through Austin College compared to the period of 1981 to the present, reversing a steep decline after 1980. (1981 reflects the beginning of a four year period in which the overall number of students certified fell significantly. That decline reversed itself sharply with the 1984-85 academic year.) At this time, it is uncertain whether the forgivable loan program will be able to bring in and hold more secondary mathematics concentrators than in the pre-1981 period. It is apparent that the forgivable loan program has had no effect on chemistry and physics as teaching fields at Austin College.

It is interesting to examine the respondents' assessment of the influence of the forgivable loan program on their career and educational decisions. Eight said the program in no way affected their decision to enter Austin College while only 3 reported it affected their decision greatly. Perhaps even more instructive are the responses to the question regarding the influence of the forgivable loan on the decision to become a teacher. Of the 7 respondents in or graduated from the program, 6 reported no influence at all and 1 reported only slight influence. On the other hand, 4 of the 6 former King Scholars responding said the forgivable loan had a moderately strong influence on their decision to pursue a teaching career. One may speculate that the forgivable loan itself was not an adequate incentive for those 4 students to hold them in a professional preparation program to which they were not strongly committed. The other ex-King Scholars remained in the teacher education program. Similarly, the current and graduated King Scholars said the forgivable loan program had little or no effect on their selection of teaching fields while half of the former King Scholars reported that the program influenced their choice of teaching field and level to a moderate extent.

It is difficult to interpret the responses to the question regarding the effectiveness of forgivable loan programs in general in attracting qualified students and holding them in teaching. The current King Scholars unanimously viewed such programs as "greatly effective," though they indicated the program had negligible influence on their own decisions. At the same time, 4 of the former King Scholars said they also thought forgivable loan programs were greatly effective, and none thought them ineffective. Perhaps this reflects a tendency for persons to endorse what appears to be "a good idea," though their own behavior may be incongruent with that idea.

RECOMMENDATIONS

Given the small numbers involved, the relative newness of this forgivable loan program, and the fact that this investigation was limited to one of the four participating campuses, it is difficult to assess the overall effectiveness of the King Foundation Scholar Loan Program in Mathematics and Science Teaching. It does appear that Austin College will begin graduating more secondary mathematics teachers than during the "dry spell" of 1981-1985. It should be remembered that the forgivable loans are limited to 5 per cohort, a small but reasonable number given the size of the college and its faculty. Ideally, the retention rate of King Scholars may be increased through even more careful selection of students and provision of more special programs, counseling, modules, etc. for King Scholars. (When a tenure-track position in education had to be filled in 1985, care was taken to select someone with a strong background in secondary science and mathematics education.) More careful selection of students assumes a larger pool of candidates through more vigorous recruiting in high schools. The King Scholars Program at Austin College seems to be widely thought of as a mathematics program. Ways should be found to publicize the fact that the teaching fields of physics and chemistry are also acceptable in the forgivable loan program. Additional funds for larger loans may also be helpful. While the maximum amount (\$2000/annum) is substantial for a student at a state institution, it defrays only a fraction of the annual cost of a private college. Of course, substantially larger loans may be seen as too burdensome to repay should a student decide not to teach or otherwise be unable to teach.

At this early stage, it appears that the King Scholars Program has been moderately successful in achieving its goal. The college could conceivably increase the effectiveness of the program. However, we should always remember that the decision to become a teacher is complex and deeply personal, and the decision to pursue teacher certification after having "real life" experience

teaching adolescents in field experiences and internships requires a genuine commitment to helping all pupils learn, and for modest remuneration. It is doubtful that any forgivable loan incentive could substitute for that kind of commitment, nor should it try to. We should also recognize that mathematics, chemistry, and physics are ususally considered to be among the most rigorous, demanding disciplines in the college curriculum. Many competent students with a sincere desire to teach may nevertheless find that their enthusiasm for teaching one of those three disciplines pales under the academic challenges they must meet.

A more distressing and fundamental problem in recruiting students for the King Forgivable Loan Program is the appallingly low percentage of Texas high school graduates who have taken Algebra II. Odell and Fifer (1985) discovered that only 17% to 18% of Texas high school students are taking Algebra II, compared to a national average of 49%. This data suggests that unless recruiting efforts for the King Forgivable Loan Program are expanded aggressively out of state, or unless the percentage of Texas high school students completing Algebra II rises suddenly and dramatically, the pool of potential candidates will remain small. Finally, we must recognize that if we wish to increase the size and quality of the pool of certified teachers in math and science — or any fields —, then hold them in the profession, improvements and innovations in pre-service training can only be part of the process. As Irene K. Spero of the College Board said before a Congressional panel in the summer of 1985, "The ability to attract the best and the brightest teachers will depend first, on making teaching a more desirable career and, only secondly, on incentives such as loan forgiveness." (Rodman, 1985)

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